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The Arboretum Bulletin



Native Bulbs in the Garden

LESTER ROWNTREE*

THE subject suggested for this short screed is an encompassing one, for nothing less than a hefty book could cover so ample a topic as "Native Bulbs in the Garden." Presuming the garden to be in the Northwest and the bulbs indigenous to the West Coast, let's consider here a few species belonging to a single genus, *calochortus*,¹ chosen from the many wild bulbous plants. It would be more fun and make much better reading to dwell on *calochortus* as it grows in nature but since home gardening must now take the place of field work, tips on cultivation are more to the point. Many of the most dashing mariposas are not adapted to gardens that are damp in summer for they belong to that group of bulbous plants which, though suffering moisture—and sometimes cold—during the winter and early spring, must have a dry, hot summer for the curing of the bulbs.

Calochortus nudus, its variety *shastensis* (*C. shastensis*), *C. uniflorus* and *C. greenei* all belong to the mariposa group having flowers with fan-shaped petals, and all endure some summer moisture. *C. nudus* is usually a pale shade of lavender with a deeper lavender crescent above the gland and always the young anthers are a lovely deep bright gray-blue.

1. The National Horticultural Magazine for July, 1932, contains some good *calochortus* pictures and the March 15, 1935, number of Horticulture has an article on growing *calochortus* from seed.

*Lester Rowntree is one of the Coast's best-known garden and native plant authorities. Her name has become familiar to many thousands of gardeners throughout the United States by virtue of her extensive writings on many plant subjects as well as through her established seed business. We are overjoyed at the chance to present something from her pen.

One erect and pointed nine-inch blue-gray leaf clasps the flower stalk which is upright at first and, as the flowers, one to twelve in number, mature, bends toward the ground. In the garden this mariposa grows well with buttercups and moisture-loving violets but, if the buttercups are allowed to become rank, is in danger of being crowded out. High shade is preferred and leaf mold with a little sand should be incorporated in the soil.

Calochortus shastensis will take more summer moisture, for it is a plant of moist meadows. The silky, shining petals are lavender-pink, with green on the outside, and there are the same pale lilac stamens and gray-blue anthers as adorn the type. This variety may grow a foot tall and carry several flowering stems and more than one leaf. It is a good mariposa to grow in the rock garden for it is happy in mossy crevices where there is moisture but excellent drainage, and it likes gravelly flats and places where most lewisias do well.

Because of the dense fringe of hairs above the gland, *C. uniflorus*, is one of many mariposas christened "dogs' ears" by the children who pick it in its native haunts. The orchid colored flower with its stigma of bright steel blue, is borne on a low stem and the leaves, longer than the stalk, remain green while the flower matures. In the garden it is a good companion plant for *Brodiaea terrestris*, and the lower growing annual *Linanthus* species make splendid follow-up flowers. If the soil is clayey and the summer likely to be wet,

sand should be added to the soil. This charming plant is pleased with sun or with light shade.

Calochortus Greenei bears larger flowers than the foregoing mariposas, its buds, blossoms and seed pods are more erect, and it blooms a little later, usually being at its best in late June and early July. It is one of the very few mariposas which will grow well in grass and it is beautiful when its large bowls of deep pink, blue or purple-lavender sway on fifteen-inch stems above *Briza minor* or among the dangling heads of *Briza maxima*. There are usually two flowering stems and more than one broad leaf. The flower has a silken sheen and its red-purple gland, lavender sepals and blue stamens all help to make this one of the loveliest of the hardy species. Not all of the two to four flowers in the umbel bloom at the same time, some are just opening their bowls while others are flattening their petals in the sun. And as the older buds come out in water *C. Greenei* makes an excellent cut flower. It grows wild with the commoner *sisyrinchiums*, *Gilia aggregata*, pussy paws, and the less rampant *Mimulus* and *Potentillas* and in the garden can be grown with any of these.

Well known *C. albus* var. *rubellus* is the deepest pink of the graceful globe tulips all of which have nodding flowers with curved petals which overlap in a beak-like tip. The flowers come in shades from pearl-pink to raspberry-red and wine-red with long hairs of the same color and usually a purple gland. I have counted twenty-four blooms on one widely arching plant. The gray leaves of this group wrap their bases around the flower stems and all members delight in soil that is rich in leaf mold.

Calochortus venustus and the Oregon form of *C. luteus* var. *oculatus* belong to the mariposa group having large cup-shaped flowers. There are many strains and many color forms of *C. venustus*. The flower stem (which may be a yard tall) is stiff and erect and carries from one to four large flowers, each flower on its own little stem. The recurved petals spread to make a wide bowl with a turned-down rim and the flowers come in an amazing assortment of gorgeous colors. Many are

quite pale but there are also bright yellows, buffs, red-purples and brown-reds and all are decorated with dashes and splashes, blotches and lines, often looking as though a painter with a too-wet brush had left a ragged edge.

C. venustus likes hot, gravelly slopes and will grow in heavy soil as long as the water passes through it and never lingers. Given these conditions it is not hard to grow.

The southern Oregon form of *C. luteus* var. *oculatus* is less like a tulip and more like a three-sided saucer. While the flowers vary in color and in interior decoration they are usually white or cream with a green zone at the base of each petal and a curved gland covered with purple-black hairs. This variety grows along the edges of woods and in open places where the dark gray loam is stiff, quite heavy, dry in summer and wet in winter. In the garden it should be given plenty of sun and grown, if possible, on a slope.

Calochortus species vary so much in their likes and dislikes that no blanket set of growing instructions for the genus can be given. Lava soil is acceptable to most, especially if leaf mold has been added; fertilizer should be avoided though a light surface application of wood ashes is beneficial. As a general thing most species need plenty of moisture during the growing season and as little as possible after the seed ripens. As long as the individual tastes of the greatly differing species in this genus are understood, calochortus growing is not difficult and the bulbs often do better under cultivation than they do in the wild.

It is not hard to raise calochortus from seed though they rarely bloom before the third year. The safest way is to sow in flats of open sandy soil and leaf mold, barely covering the seed and being sure that it is sown thinly. Keep moist during the winter but stop watering when growth yellows. A temperature of 55 or 60 degrees is suitable. After a year, the bulbs are the size of a pin head. The second spring they have gone to the bottom of the flat and when cured should be planted out in the garden.

‘ ‘ ‘

The clear, pink form of *Azalea nudiflora*, Pinxterbloom, is a fine garden shrub.

Violas

MYRTLE R. THORGRIMSON*

*"Welcome, maids of honor,
You do bring in the spring,
And wait upon her.*

*She has virgins many
Fresh and fair; yet you are
More sweet than any."*

Robt. Herrick—"To Violets."

THAT the violet is one of the oldest and best loved of flowers is attested by the fact that it is mentioned by many of the earliest writers. Theophrastus, third century, B. C., a pupil of Plato and Aristotle, in his "Inquiry into Plants" mentions the violet along with the lily and the rose.

Gerard in his Herbal, published in 1597, includes the heart's ease and several varieties of violets. In describing their medicinal value (the virtues) he quotes from at least four earlier herbalists, thus showing the plant was well known and valued long before his time.

Parkinson, one of the greatest of the early English herbalists writes:

"The garden violet (for the wilde, I leave to their owne place) are so well knowne unto all, that either keep a garden, or hath but once come into it, that I shall, I think, but lose labour and time to describe that which is so common."

His point is indeed well taken as the violet is well distributed over the earth, from the lowlands to mountain fastnesses; from bog and woodlands to desert regions; and from the icy plains of Siberia to the warmth of the Mediterranean.

The violet has been able to adapt itself to any soil, temperature, or moisture condition and while varying in a great degree as to color of bloom and leaf form has never lost its essential character and rarely its fragrance.

Farrer lists over one hundred species, all beautiful and suitable for the rock-garden. Bailey says there are "three hundred species widely distributed in the north and south tem-

perate zones of both old and new world, of which about eighty species are native to North America."

The Pansy

The heart's ease, or pansy, as described by Parkinson "hath his leaves longer and more endented or cut on the edges than the violet hath and somewhat round withal; the stalks are upright yet weake and ready to fall down and lye upon the ground; set here and there with like leaves whence come forth the flowers, of little or no scent at all, made like a violet yet more open * * *" He continues with a description of the various colors and ends thus "the seede is small, whitish and round, contained in small heads; the roots perisheth every yeare and raiseth itself up plentifully by its own sowing, if it be suffered" thus identifying the heart's ease as an annual.

Pansies of the present day are the outcome of many years of persistent effort on the part of a comparatively few enthusiasts, who by dint of infinite patience and labor in collecting, in growing from seed and in careful selection have helped to evolve the glorious blooms that are now so largely grown. The development of the pansy as we now know it is to a certain extent wrapped in obscurity. The earliest detailed information we have of special work being done with the pansy is that of Lord Gambier and his gardener, Thompson. These two pioneers conducted their experiments at Ives in Buckinghamshire, in the early 1800's. They first began experimenting with the common viola tricolor or heart's ease and, encouraged by their success with this species, widened their field of operation by working on other native species. The work of improving the pansy has continued to the present day and it is difficult for us to imagine that the beautiful race of show and fancy pansies ever had so humble a beginning.

The pansy is in reality an annual, as was its forbear, the heart's ease.

The Viola

And now we come to the tufted pansy or the

*Well known throughout the Puget Sound region for her wide experience with many kinds of trees, shrubs and herbaceous plants, Mrs. Thorgrimson here sets down in her delightful style, the results of her own observations on the culture of violas.

viola as we know it. Dr. Stuart, an Englishman who has done so much in the development of the viola says: "Botanically violets, pansies and heart's ease are all the same (genre). Tufted pansies are crosses from the garden pansy and *Viola cornuta*, the latter being the seed parent. Crossed the other way, the result will be a common enough bedding pansy."

Viola cornuta being a perennial, gives the viola its permanent habit, for the viola is a true perennial, more beautiful than the violet and for general utility greatly superior to the pansy whose growth is spreading and straggly.

The viola with its upright compact growth, its hardy and robust constitution combined with such beautiful and remarkably diverse colorings and sweet scent, places it in a rank second to none as a valuable garden flower. It is delightful when used in groups in the front row of perennial borders; in masses as borders of beds, or as ground cover among roses. Care, however, must be taken not to plant close enough to the rose bushes to prevent their proper cultivation.

One of the most useful and pleasing characteristics of the viola is the extensive period over which it bears its flowers, the plants beginning to bloom early in the spring and continuing until late summer or early autumn.

Propagation

My experience has been that violas like a well enriched soil with light shade and plenty of water during the dry season. If desired, a mulch may be used around them to prevent drying out. If violas are well planted, *i. e.*, the soil properly prepared and fertilized, very little care will be needed until the time arrives, as with any other perennial, for lifting, dividing and replanting—which now leads us to the various means of propagation. This may be done by seeds, by cuttings, and by division. In propagating from seed, care should be taken that only the best seed obtainable is used; if possible from a specialist or from the grower's own plants, if they are excellent.

It should be remembered that violas grown from seed will not come true, except rarely, as they are hybrids.

There are several periods during the year when seed may be sown; it is to a great extent a matter of convenience. A sowing may be made late in the summer in a special mixture of equal parts of loam, leaf mold and sand. The mixture should be placed in flats and the seeds either broadcast or planted in rows. Cover with a thin coat of fine compost, and press the whole surface down gently and evenly with a board. Such care as is given any choice seed, as the exclusion of light until the seeds germinate and never permitting the seed box to dry out, should follow. As soon as the young plants are large enough to be handled, or at the showing of the fourth leaf, they should be pricked out into other flats, three to four inches apart. By early spring these plants should be large enough to set out. It is well to remember that first blooms are not always typical, therefore plants should not be discarded until fully tested.

To obtain plants like the parent, violas must be propagated vegetatively. A favorite variety may be increased by taking cuttings which may be dipped in a hormone powder and inserted in sand. If there is a layer of peat under the sand, or if the rooting medium is a mixture of sand and peat, the rooted cuttings will be more easily handled. For early spring flowering, the cuttings should be taken in July or August and should consist of the new growth. These new plants should be ready to set out in their permanent place by October.

The best method of propagation, however, is by division. When the plant is spent and new growth begins to develop, the old tops should be cut away and the new growth encouraged by cultivation, watering and a small amount of fertilizer. When the growth has attained a height of about three inches the plant should be lifted and divided. Every little tuft or stalk will be found to have thread-like roots. As many as are consistent with the size of the plant should be taken off gently. The old plant should then be replanted, and the divisions placed in specially prepared beds of neutral soil. If this is done fairly early in the summer the plants will be ready for spring blooming and will be larger and better than those propagated by seeds or cuttings.

Delphiniums

JAMES M. MCCONAHEY*

THE universal popularity of the delphinium today is undoubtedly due very largely to the wonderful improvement made during the last decade by our American hybridizers in this, one of our finest perennials. For many years we were obliged to rely mainly on English hybridizers for the best seeds and plants, but this is no longer necessary as our American hybridizers are now producing delphinium as fine as, and in many ways finer than, those of any other country.

Many people feel that they will get quicker results and better flowers by securing large clumps, but this is not the case. Far better results can be obtained from seedlings, which, if properly planted, watered and cultivated will soon form the desired clumps with sufficient root systems to maintain large plants. The older and larger clumps are somewhat exhausted, resent being disturbed, and do not produce the finest flowers.

In purchasing seed one should deal with specialists from whom the best seed can be obtained. Cheap, inferior seed will not produce fine flowers, and it costs no more to care for the new improved varieties than for the old, inferior ones. There are many excellent strains on the market. In England the Blackmore and Langdon and Wrexham strains are among the best, but seeds from them are rather difficult to obtain. In the United States the oldest and one of the best known is the "Hoodacres" strain, one variety of which is the original, satisfactory, white delphinium. Another which is highly regarded, especially in the Eastern states, is the "Lyondel" strain. The "Pacific" strain, a fine strain developed here on the Pacific coast, is producing plants with large flowers, clear colors, and whippy growth that will withstand winds to a high degree. The "Wheelercroft" strain, also developed on the

Pacific Coast, is producing plants with large, beautiful flowers.

Plants from Seed

Delphiniums can be easily grown from seed by following a few simple instructions. Seed should be sown as soon after harvesting as possible, preferably in July or August. For best results, sow in flats in a mixture of about one part coarse sand, one part coarse leaf mold and one part loam. If you cannot conveniently prepare this mixture a light sterilized soil may be secured from a florist. Cover only slightly with the same mixture, then cover with burlap and water thoroughly. Never let the flats get dry even for a minute, as that is fatal. Keep in a fairly dark place until the plants begin to appear, which will be in about ten days, then immediately remove the burlap and give them more light, but keep shaded and moist. When second leaves are developed prick out into flats about three inches apart in a mixture of about one part sandy loam and one part coarse leaf mold. Keep shaded for two or three weeks, then gradually give more light and finally harden off in full sunlight. In this climate it is best to keep the flats over winter in a cold frame or other protected outdoor location, and as soon as the plants become large enough in the early spring, plant them in a permanent location about three feet apart. Seeds may also be kept in a tightly sealed jar in a refrigerator and sown in February or early March, but germination is not usually as good as if sown when fresh. Summer grown seedlings will bloom the following spring or early summer, and spring ones in the following fall.

Growth and Care

In growing delphiniums a situation should be selected that has a free circulation of air, not too close to a building or solid fence. They thrive best in wide borders by themselves where other plants do not shut off the light and air. Low-growing companion plants may be grown in front of them to work out various color schemes.

*Mr. James M. McConahey is conceded to be the real delphinium specialist in the Puget Sound region. For many years he has made an intensive study of the best forms for garden use. Through his experience in growing many thousands of the beautiful plants he has developed a program of procedure which has given him very exceptional results. We think that our readers, too, will enjoy knowing how to succeed with them.

Any ordinary garden soil is satisfactory, but they must have good drainage; they will not stand swampy conditions. Heavy clay soil may be put into condition by the addition of sand, stable manure, peat moss and leaf-mold, with enough lime to sweeten. Light sandy soils that will not hold moisture need cow manure, peat moss and a little clay or other heavy soil. All soils need humus which can be any form of decaying vegetable matter, and should be spaded deeply and the materials added to condition it well mixed. Bonemeal is a good fertilizer for delphiniums and a fair amount should be worked into the soil at the time the bed is being prepared.

After delphiniums have bloomed the spikes should be cut off directly above the top leaves to keep the plants from going to seed. Forming seed is a severe strain on the vitality of the plant and should not be permitted unless one is definitely interested in growing seed. As the leaves fade, and the new shoots appear the balance of the spike should be cut down. Then give the plants a small dose of fertilizer, cultivate, and soak well.

Slugs, one of the worst enemies of delphiniums, can be effectively controlled by the use of any of the good baits now obtainable containing metaldehyde. Place the bait in small heaps near the plants, cover with some light article, and if there are any slugs near they will come to it, dine heartily, then go to sleep never to wake up. Some varieties are subject to mildew in the late summer, but this can be controlled by any good mildew spray.

The climate of the Puget Sound country is better suited to the growth of delphiniums than that of any other section of the United States, and this stately, beautiful flower should be one of the most popular of the many fine flowers grown here.

1 1 1

Osmarea Burkwoodii bloomed this spring for the first time at the Arboretum. It is an exceptional plant and worthy of greater use in our gardens. The habit is very good, neither too loose nor too open; the growth is slow; the evergreen foliage is a deep green, excellent for low backgrounds. In addition it produces a wealth of lovely, fragrant flowers.

Six

Madrona

I think that I shall never own a
Nicer tree than a madrona.

It's true its sweet is blent with bitter—
It sheds unconscionable litter;

All year it seems to come to pieces;
Disintegration never ceases.

Its leaves and berries won't stay on;
They clutter up my tidy lawn.

And through the months it sheds its bark . . .
But, then, my yard is not a park,

I sorta *like* to rake the lawn—
Besides, it cuts my embonpoint.

And what care I for raking duty
When I behold madrona's beauty,

In lacy, leafy pattern set
Against the sky, in silhouette;

Its lovely reds and yellows look
Like pages from a sunset's book;

Its strength, its dignity profound
Seem borrowed from old Puget Sound.

Oh tree, indigenous and native,
Symbolic and yet decorative,

You make me proud to be your own—
Northwesternest of trees, madrona!

—ED ADAMS*

*Ed Adams has made a host of friends in the Pacific Northwest, not only through his writings, his lectures, and his weekly featured radio broadcast, "Reading for Fun," but also through a genial personality and a lively, native wit which probably is nowhere more apparent than in some of his poems about the Puget Sound country.

1 1 1

Cut Flowers Last Longer

Experiments in the keeping qualities of cut roses at Cornell University as reported in *Cornell Plantations*, Vol I, No. 3, have shown that "roses cut at 4:30 p. m. kept 7.3 per cent, or 7.4 hours longer than roses cut at 8:00 a. m." Sugar concentration is the important influence that determines length of life of cut flowers. Leaves manufacture sugar during the day, thus the later they are cut, the greater the amount of sugar. Change water daily, cut an inch off the stems and rinse in cold water, and wash container with soapy water.

How to Grow Annuals Successfully

AUSTIN SPENCER*

TO THE average person an annual is just one of those things that you buy from a store because they are for sale and one is told that they will bloom this year. This is true more or less, but an annual is rather a different thing to gardeners. Strictly speaking an annual is a plant that grows, bears fruit or flower, and seeds itself in one year. Hence its name. As a matter of fact this definition is slightly incorrect. An annual is a plant that grows into maturity and then dies in one year, and one from which a cutting cannot be taken.

Annuals are divided into three classes, *e.g.*, hardy, half hardy and tender or greenhouse. The latter class can be left for those with greenhouses to deal with, as in many cases they are rather difficult and temperamental and for this reason should not be handled by the average gardener.

There are many popular annuals that are grown and bought each year that are to a certain degree perennials. These can be carried over each year by being protected from the winter frosts and also by taking cuttings from them in the late summer. Amongst these are the antirrhinums, stocks, petunias, heliotropes and many others of similar growth characteristics.

These particular "annuals" really need a whole article. Though space does not permit a full discussion at this time, they will be dealt with to a certain extent a little later on.

The first types to be considered are those which are known as "half hardy" annuals. They have a rather slow growth and need a certain amount of heat to encourage them. For this reason, therefore, they are started in cold frames, hot beds, greenhouses or in many cases in the home itself, if they can be provided a warm room and a sunny window.

*Mr. Austin Spencer is one of the Northwest's true garden "characters." Plenty of good, solid, common sense, combined with a nimble wit and a highly developed sense of observation, have brought him to an enviable position among our garden authorities. He is the "Garden Man of the Vancouver, B. C., Sun" and the "Old Gardener" on the air. Many of our readers will recall happy moments with his reports.

The first principle of successful culture of these plants is to use sterilized soil in the flats or seed pans in which you sow them. This sterilization of the soil is very easily accomplished. All you have to do is to get an old washing-up dish, fill it full of soil, and then put it in the oven until it steams. Then let it cool off, and it is ready for use. This compost should comprise some good garden loam, about a third well-rotted manure, and a little sand.

When you sow the seed scatter it on top of the soil and then put about an eighth of an inch of the same mixture on top of it.

After the flat or pan is sown it should be watered by immersing it in a large enough container of water, leaving it there until such time as the top of the soil becomes moist. Then remove it and cover the top with newspaper and put it in a sunny spot. See that it is kept just moist from time to time, and as soon as the seeds have germinated remove the paper. Covering the containers with glass will also help.

The great trouble that is experienced by the majority of amateurs is something that is known as "dampening off." This is usually looked upon as being caused by the water dropping from the glass on to the tiny seedlings. It is nothing of the sort. It is a disease which is found in the soil, no matter how it is sterilized. There is a very successful remedy for this. Directly the conditions obtains, which is easily seen by the seedlings just laying over and dying, sprinkle some fine flowers of sulphur over the affected area as well as around it and you will have no more trouble.

As soon as the seedlings are large enough to handle they should be pricked out into another flat, using the same sterilized compost. When you do this give them plenty of room, and if possible do it at least twice before you actually plant the seedlings out in the garden. The reason for this is that the transplanting stimulates and strengthens the root growth and it is an accepted fact that the better the root system the better the ultimate crop of bloom will be.

When they are fairly large, say after the second pricking out, put them outside for an hour or two in the middle of the day and lengthen the period each day until they are out altogether. This is what is known as hardening off.

When the actual planting-out time arrives, be sure and give them plenty of room. They are such tiny, puny, things that they do not look as if they will ever grow. Overcrowding is bad no matter whether they be plants or anything else. The soil has only a certain amount of nutriment and can only feed or supply so many plants or units. This rule applies particularly to asters, antirrhinums, annual larkspur and zinnias.

Incidentally, these last mentioned types are the only ones that are subject to any disease or pests. Asters are noted for their susceptibility to wilt.

The aster wilt has been controlled to a certain degree by the development of a wilt resistant seed. As it is not always infallible they should be watered round the roots with a solution of permanganate of potash. The solution should be made so that it is just a light purple. The method was discovered by W. T. Willson of Burnaby, B. C., who has been gardening here for over forty years. He says that he has never known it to fail. Just one more word about asters. After they have been planted out and watered in, they do not need any further watering, no matter how dry the season may be.

A "pest" or disease that worries antirrhinums is what is known as rust. This has also been controlled to a very slight degree by the introduction of rust resistant seed. It is, however, very slight and, further, various varieties do not come true. The only way to really control it is to dust it well with fine flowers of sulphur.

Larkspur is subject to mildew and is treated by the same method as rust.

Zinnias, especially very young plants, are attacked by slugs and sow bugs. The only way these can be prevented from chewing up the leaves and killing the plant is by dusting the leaves thoroughly with arsenate of lead.

As has already been stated space does not permit a discussion or description of all the annuals, but when you go through your catalogs they are all described as half hardy or hardy, and you should be governed accordingly.

Hardy annuals are those that are sown directly out of doors. For some reason they are not too successfully grown unless this method is followed. As soon as you have decided what you want to plant get the ground ready for them. This is done by digging it well over and removing all stones and debris. If possible the soil should be sifted. It is not easy to sterilize it, but you can do so by watering it with a solution of corrosive sublimate, using the proportions of one ounce to six gallons of water. Drench the soil well about three days before you sow your seed.

All packets of seed have full instructions as to depth and place to sow them, and these must be followed. The main thing to remember in this and in the case of half hardy annuals is to get the best certified seed obtainable.

One thing to avoid is sowing too much seed. If you do you will get irregular growth and give yourself a great deal of unnecessary work later on when thinning out the seedlings.

This thinning out must be done no matter how thinly you sow your seed, with the exception of very large seed such as nasturtiums and other such things.

Then another thing that must be remembered is arrangement. You must have your plants graded so that the small ones are in the front of a bed and the taller ones are at the back. Every catalog usually states the height to which the plants grow and you should be guided by that.

Another important thing to remember is that blooms must not be allowed to fade on the plants. They should be picked almost every day. They are ideal for interior decoration, or for giving away to less fortunate people. As soon as a bloom starts to fade it starts to form seed, and this takes all the strength away from it. Any plant, no matter whether it be an annual, biennial, or a peren-

(Continued on Page Ten)

A Canadian's Viewpoint on the Preparation For and Planting of Trees and Shrubs

JACK RENTON*

THE failure of trees and shrubs to give satisfaction after planting in their permanent position, can in most cases be traced to the faulty preparation of the ground or wrong manner of planting. The proper time to prepare the ground for planting trees and shrubs is before the time of planting arrives. This work should be done in as perfect a manner as circumstances will allow.

It is well to bear in mind that once the tree or shrub is planted it is there to stay without interference under the roots. The surface soil can be enriched by mulching at any time, but not so underneath.

Should the natural soil be shallow or of a poor nature, this should be remedied by breaking up the sub-soil and enriching the same by manure or bringing in soil of the required quality. There is really no hard and fast rule by which one can go, as to the depth of soil all trees and shrubs require. Small growing varieties will thrive in say two feet of good soil, while large growing trees will require from four to five feet to bring them to perfect specimens.

The nature of the soil should be studied for the requirements of the species of trees or shrubs to be grown. Some will thrive in light soil while others will require a clay loam and for many of the Erica family it will be necessary to have a rooting medium of peat.

Should the ground be wet it will be necessary to drain in a proper manner so that at no time will water stay to any great extent among the roots. Too much moisture around the roots of newly planted trees will, in most cases, be fatal. All draining should be done before the land is prepared to receive the plants.

In the making of shrubbery borders or beds,

it will be necessary to break up the whole of the border or bed to the required depth, at the same time enriching the whole of the grounds. The cause of many failures can be traced to having broken up only enough of the sub-soil to receive the roots, thereby forming a pocket which retains the water throughout the winter. This is fatal to most plants.

When about to plant trees on the lawn, providing the land is properly drained, it will not be necessary to enrich the whole area. About six to eight square feet will be all that is necessary to take care of the tree until it is well developed.

Holes taken out in this manner should be prepared so that all excess moisture will drain off either by a system of drainage or into the surrounding land.

Again: When digging holes to receive the roots, never dig cup-shaped but have the hole slightly larger at the bottom than the top and either level at the bottom or slightly deeper around the edges. Holes that have been dug cup-shaped have a tendency to cause the roots, when they reach the edge, to grow up, and a tree planted in this manner will be easily blown over by wind.

After the ground has been prepared and the holes dug to receive the plants, the time has come to have them brought from the nursery or garden where they may have been heeled in.

It is a poor practice to have plants exposed to the sun, wind and cold while one is busy digging the holes, which might take some time. The shorter the time between digging plants up and resetting, the better it will be for the plants. After opening a package of trees or shrubs the roots should be protected in some manner until ready to replant. This can be done by throwing a little soil over the roots, by covering with wet sacks or, where the plants are small, by having the roots in a bucket of water.

When purchasing trees or shrubs, more attention should be paid to the root system than

*When one inquires in the Vancouver, B. C., area for the name or names of the outstanding professional gardeners, one is almost invariably referred to Mr. Jack Renton, head gardener at the Essondale Hospital at Essondale, British Columbia. In his article, Mr. Renton has undertaken to lay proper emphasis on certain of the garden details which are often overlooked. While he writes from Canada, it must be recognized that the principles will hold in other sections, too.

to what is seen above ground. Much stem and many branches with a poor root system may look good to some people thinking to get quick growth, but under those conditions one will generally be disappointed as such a plant, should it survive, will take years to make root enough to support a growing head. Trees and shrubs which have been well grown in the nursery should have been regularly transplanted to form a good root system. Such trees or shrubs will, to some, look stunted in size but will soon recover and make splendid growth.

Before setting the plant, examine the roots and cut off all which may have been badly broken in digging.

The holes should have been made quite a bit larger than the spread of the roots. In no case should the roots be cramped or bent when planting.

Next, calculate the depth the plant is to be set and proceed to fill up the hole either with prepared soil or with a layer of well decayed manure. Should manure be used, this should be covered with a layer of soil to the proper depth and well firmed and leveled. Next, set the plant, making sure that when the operation is completed the plant will be as deep or slightly deeper than it was before. Spread the roots out as straight as possible and lightly cover with soil. While doing this, move the plant up and down; this will get the soil well among the roots and guard against any chance of the roots being matted and without being intermixed with soil. When all roots have been covered and well firmed, place a good layer of rotted manure around the outer edge of the hole. This will be in a position for the roots to take hold of when well started into growth. In no case should manure come in contact with the roots. Then fill up the hole to the level of the ground, all the time firming by treading.

After planting, each tree or shrub should be looked over and, where necessary, staked to make secure from wind storms. Also, all damaged branches should be removed and the head reduced to correspond to the size of roots. A plant with a poor root system should

be pruned so that the root system will be able to furnish food for the growing top.

It is a general rule that most deciduous trees and shrubs should be planted slightly deeper, say from two to four inches, than they were in the nursery. One must bear in mind that deep planting, especially in heavy soil, is the cause of many failures.

Evergreens as a rule cannot stand deep planting, especially the fine leaved varieties and rhododendrons. These should have their roots just covered.

Some people, in planting, use water to firm the soil among the roots. Except in very dry weather, I believe this to be a poor practice, as the water has the effect of making the soil into a cement-like mass, into which the young roots will not grow readily.

The planting of deciduous trees and shrubs can be done at any time from the fall of the leaf until growth starts in the spring. All things being favorable, it is best to do all planting as soon after the leaves fall as possible. This allows the soil to become settled by winter rains and be in proper condition to permit root growth with the first warm days in spring.

No planting should be done when the soil is very wet, when frozen or when snow is on the ground. Snow or frozen soil buried near the roots will have a retarding effect upon the growth of any plant.

Never rush the work when planting. The more care and pains taken at this time, the greater will be the satisfaction in the growth of the tree or shrub.

1 1 1

DELPHINIUMS

(Continued from Page Eight)

nial spends its time and strength in forming seed to reproduce itself, so as soon as the embryo seed is taken away, it goes ahead and produces more. You will find that as the season advances the blooms will get smaller and smaller, but in the late fall you will have bloom and color in the garden and that is what everyone wants.

Growing annuals is not a difficult job provided the foregoing simple rules are followed and, moreover, they are ideal for beginners, as results are obtained very quickly.

Summer Propagation

PAUL D. BROWN*

THE old terms "hardwood cuttings" and "softwood cuttings" are misleading in some respects. To the lay gardener the latter applies more particularly to such indoor crops as geraniums, chrysanthemums, etc., while the former refers to the propagation of such plants as grapes and some ornamental shrubs that are put through a "callousing" process.

As a preferable substitute I would like to suggest that my subject be considered to include all those types which would naturally fall under the term "Propagation from *new-wood*." This, too, may be misleading if used without some modification. The *new wood* may be quite soft, as in chrysanthemum cuttings, or it may be quite mature, as would be the case with camellias. A further differentiation should be made from the "heel cutting" which includes a part of the old wood. Any terminal cutting of the current season's growth, regardless of length or maturity, would be a *new-wood* cutting, and the maturity of the *new-wood* is of primary importance as applied to azaleas, camellias, and many other flowering shrubs. The degree of maturity will govern the percentage of success and also the length of time for rooting. Ordinarily cuttings from the more mature wood will require a longer period of time but will need less attention, while softer wood may produce roots sooner but be more exacting in its demands. Some shrubs are quite particular as to the degree of maturity, while propagating wood may be taken from others over a considerable period. Though camellias are usually propagated from ripened wood it is still *new-wood* of the current season's growth. Thus this article will deal entirely with cuttings made from "*new-wood*."

The rooting *medium* may be the same for all degrees of maturity of the cuttings, and

for the majority of shrubs a mixture of two parts of water-washed sand and one part screened peat is satisfactory. The amount of peat may be increased or decreased according to the texture of the sand. Other mediums have been tried and proven more or less successful, but no medium is foolproof. However, the above formula will be satisfactory for most shrubs.

What is perhaps more important than the proper *medium* is the preparation for the operation, the type of container or cutting bed, and the subsequent care. It is an easy matter, with the facilities we have at the Arboretum, and with the use of hormones, to obtain a high average of success. But for the amateur it is quite an achievement to root even the Kurume azaleas against the great odds which face him, and with makeshift apparatus. The small home greenhouse may prove a detriment rather than an asset unless a good, working knowledge of the many factors involved in successful propagation can be developed.

Equipment

A well constructed cold-frame of standard size (multiples of 3x6 ft. sash) with plenty of drainage, possibly with insulated sides, and sloping to the south or east, will be nearly ideal. This can be equipped with heating cables, under thermostatic control for bottom heat. It can be covered with sash to maintain moisture, or lath for shade, or both. In many instances cuttings can be left in this frame all winter. Sometimes it is more practical and economical to insert them in the recommended soil mixtures in flats or small boxes, these to be placed in the cold frames. In either case drainage under the frame is necessary.

The rooting medium should be watered almost to the saturation point and allowed to drain a few hours before the cuttings are inserted. It is necessary to firm the sand with a brick or wood tamper. With the use of a lath straight-edge and an old case-knife a narrow trench is made through the sand. The cuttings are then inserted to a depth of one to

*Mr. Paul D. Brown came to the Arboretum in 1943 as superintendent. His feeling for plants and his knowledge of their care and culture have contributed to the general improvement of the area since that time. While he has many special interests, one of his favorite fields is plant propagation and, since the season for the propagation of innumerable forms of shrubs is at hand, we think our readers will be particularly interested in what he has to say on the subject.

one and one-half inches and, depending on size, about three-quarters inch apart. When the row is filled place the straight edge against the cuttings (not so near as to bruise) and tap it with a hammer to firm the sand back in place. Now another row can be started, the width of a lath away. After the cuttings from each group are all inserted water them in thoroughly with a fine sprinkler. This crowds out air pockets and packs the medium close about the stems. Each group should be clearly labeled right away to avoid later confusion.

Some prefer to place cuttings in regular flower pots and then to plunge the pots in the frame so that they do not dry out so rapidly. Such a system is very satisfactory where only small lots of any particular variety are made, since it is so much easier to keep the different kinds segregated. Several cuttings can be put into a five or six inch pot, the pot, of course, being filled with the regular rooting medium. As in the case of *Clerodendron* and *Saint-paulia*, it may be advantageous to place a single cutting in a 2½ or 3-inch pot.

If electric heating cables are used they should be covered over with ½ inch or more of sand before flats or pots are placed over them. If the propagating medium is to be used directly in the frame, it should be 3½ to 4 inches deep after tamping. It will be necessary to have the hot-bed sash or other sash fit tightly over the frame.

Making Cuttings

The propagating season usually starts about May 15 and continues until late fall. However, the greater number of shrubs will reach the best degree of maturity in July and August. Deciduous azaleas such as *R. altaclarens*, *occidentale*, *molle*, *luteum*, and the Ghent hybrids, will "strike" better with a moderately soft cutting; however, they may also be taken later. Deciduous shrubs such as deutzias, weigelas, some lilacs, spiraeas, privets and the like, will root quite readily with moderately soft cuttings.

Experience will tell at the feel of the wood if it is ready. Some authorities have stated that the condition is just right when the young wood "snaps off" easily as it is bent abruptly between thumb and fingers. This statement is

too dogmatic to cover all types of shrubby plants. It may, however, serve as a *broad, general* guide from which the gardener can work. Even limited personal experience with different shrubs will demonstrate clearly how close one can adhere to such a rule or how far one must depart from it. For example, the rule would not hold for camellias, deutzias, weigelas, and hydrangeas. On the other hand it might be all right on some easy-rooting species like Kurume azaleas.

Some broad-leaved evergreens such as escalonias, certain cotoneasters, viburnums, and hollies, will root well in mid-season, prior to full ripening of the new wood. Kurume and obtusum type azaleas strike best from moderately mature wood, but not from hard wood. July 1 to August 10 is a safe period, but the early part of the period is always preferred. Cuttings of certain conifers such as juniper, arborvitae, cypresses, and cedars, will root during this period or they can be taken later and allowed to stay in the sand all winter. Camellias should not be taken until the new-wood has turned a dark brown color below the terminal bud. This is usually in August.

The length of the cutting will govern the hardness of the wood and, vice-versa, the proper hardness for best rooting will vary with the length of the cutting. The average length for most deciduous shrubs will be three inches. Kurume and obtusum azaleas may be nearer two inches; camellias, four inches, etc. A *sharp* knife is essential. The lower cut may be slanting or at right-angles, but it must be clean without any bruising or peeling of the bark. Ordinarily it does not matter whether the cut is made at, above, or below a bud although many prefer to make it just below the joint to be sure that at least one bud is in the sand. If the center of the stem is pithy or hollow the cut can be made directly through the bud or joint. The lower leaves are removed flush with the stem and some prefer to cut away a part of the upper leaves to prevent excessive transpiration. This is necessary if the leaves are large and soft as in some hydrangeas.

There is no doubt about the use of hormones. They are a real help in rooting the

cuttings of many shrubs. For the small lot the powdered hormone is the simplest to use. The base of the cutting is dipped into the powder and then tapped to remove any excess material. Hormones of different strengths are available and some manufacturers publish the recommended strength for extensive lists of shrubs and herbaceous plants. However, this alone does not insure success.

Allowances can be made for lack of experience and differences of opinion as to how a cutting should be made or put into the sand, but the care taken and method of culture from this stage must be absolutely right. It will be advantageous to take all the cuttings that are desired from a given plant at a given time so that they can receive the same treatment. This is especially desirable where only one cold frame is available. As soon as the cuttings have been "watered in" they should be covered with sash and protected for a few days with heavy shade. The shade can be removed during dull weather. The close, humid, condition is necessary to prevent wilting during the vital interval before the roots form. After ten days or two weeks it will be possible to allow a little air to enter provided the cuttings are not permitted to dry out. The shade must be kept on whenever the sun is bright. Do not let your curiosity provoke you into pulling them out every few days just to see if they are rooting. *Deutzias* and *weigelas* will be rooted in four to five weeks, but *azaleas* should be left undisturbed for eight or ten weeks. If the different classes of cuttings are placed in separate boxes they can be removed as they are ready. *Camellias* and a few other broadleaved evergreens can be placed in the sand later than most shrubs and, as they require ten to twelve weeks to root, they may be left in the rooting medium all winter. These will need a little bottom heat, of course. The thermostat should be set at or as near to 68 degrees as possible. Be sure the electric current is shut off when rooting is completed if the cuttings are allowed to remain in the sand for the winter.

Using *Azalea Hinodegiri* as an example, with cuttings made July 1, treated with hormone and allowed to remain undisturbed until Oc-

tober 1, they may be taken from the propagating frame and transplanted into flats, pots, or plant bands, into another compost made of leaf mold, peat, and sand (equal parts), and then placed into another frame. This can be a temporary frame of 12-inch boards, or a regular cold frame. After thoroughly watering, cover with cloth or lath. The lath can be kept on all winter. Make sure there is drainage underneath.

If during the rooting period there are indications of damping-off, mildew, or fungus, remove all affected cuttings and dust with a Bordeaux powder. Keeping the glass too tight on warm days may generate too much heat and a little ventilation may be necessary for a short period each day even at the start. In this case watch the watering closely. Wetting down the medium with a solution of Semesan before the cuttings are inserted is a good precaution. If aphids appear spray with a good rotenone or nicotine solution. Reduce the strength from what you would use on growing plants. Make sure cuttings are placed deep enough and firm enough so that they are not disturbed when watering. Use a sprinkling can or fine rose-spray on a hose. A light syringing over the top of the cuttings is necessary each day with an occasional heavy watering to keep the sand wet.

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The cotoneaster group furnishes us with many ornamental varieties from the erect upright types, to very prostrate forms. One outstanding species is *Cotoneaster salicifolia*, Franch. from western China, half evergreen, pest free, and growing to ten feet. Its drooping, graceful branches make it a most desirable plant for foundation use, and for pool backgrounds. Cut branches, with the clusters of bright red berries, are most decorative when mixed with holiday greens. In early spring the new leaves stand erect at the base of the old leaves like little candles, giving an unusual effect. A more common but worthwhile cotoneaster is *C. Francheti*, also a native of China. The leaves have a gray cast, some of them turning red in winter. It is also very hardy and pest free.

Hormones and the Propagation of Certain Evergreens

By ARTHUR S. MYHRE and C. D. SCHWARTZE*

Washington Agricultural Experiment Stations, Western Washington Experiment Station, Puyallup, Washington

THE pioneers who settled America found here for the most part a land of surpassing beauty that required no improvement at the hands of men. But with the growth of towns and cities, the ugliness of man-made things began to cast a blight upon the natural beauty of the land, and the instinctive desire to create beauty began to assert itself. Gradually there has developed in this country a widespread appreciation of the value of ornamental trees, shrubs, and flowers, both for the improvement of public and private properties and for the spiritual enrichment of the lives of those who work with these ornamental materials and fall under the spell of their charm. Before the United States became involved in the present world conflict, real progress had been made in developing public consciousness of the value of ornamentals and it seems inevitable that with the return of peace ornamental gardening and landscape art will assume an increasingly important place in American life.

The growing appreciation of ornamental plants has created a constantly increasing demand for more and better materials. In response to this demand, commercial propagators have built an industry of great magnitude, and many amateurs have found in plant propagation an absorbing and profitable hobby.

Here on the Pacific Coast, the propagation of ornamentals offers opportunities that are unsurpassed elsewhere. Cool summers and relatively mild winters make this an ideal location for propagating ornamental trees, shrubs,

plants and bulbs, many of which require special winter protection in colder climates.

In propagating many different species and large numbers of individual plants annually, commercial propagators and amateurs as well, have encountered difficult problems. Not the least of these has been the difficulty of propagating certain kinds of plants from cuttings, especially those that are not more readily propagated by other methods.

Root-Promoting Chemicals

This problem has attracted the attention of many plant scientists and much experimenting has been done at agricultural experiment stations and elsewhere in attempting to develop improved methods of propagating these plants. One of the outstanding contributions made by such research has been the development of chemicals that stimulate root formation on cuttings of woody plants. Experiments by many investigators and the experience of commercial propagators in many parts of the country have shown that the rooting of cuttings of many species of plants can be greatly improved by the proper use of certain chemicals. The most helpful of these so-called plant hormones are certain organic acids, including indolebutyric acid and naphthaleneacetic acid. Difficult as these names are, it is worthwhile for all plant propagators, both professional and amateur, to become familiar with them and with the trade names that have been substituted for them. Unfortunately, the original chemical names do not appear on many of the products offered in the market and they are not all equally effective in promoting the formation of roots on cuttings. Consequently, confusion exists as to the nature of some of these products and their usefulness. Doubtless many failures in the use of root-promoting chemicals could be traced to insufficient knowledge as to the nature of the chemicals employed. It would be very helpful if every retail merchant could know the actual chemi-

*Arthur S. Myhre is assistant in horticulture at the Puyallup station and has been engaged in research work with a wide range of horticultural crops, including ornamentals. Dr. C. D. Schwartze, research horticulturist at the station, has been actively interested in various phases of experimental work there for more than ten years. The press of his activities with fruit crops has limited the amount of time available for research on ornamentals. The thoroughness with which the authors have developed their subject prompts the hope that more time and facilities will be placed at their disposal in the future for continuing studies along these lines.

cal content of each product that he offers as a "plant hormone." But, because better chemicals are likely to be placed on the market from time to time, it would seem desirable to discard trade names and sell these chemicals under names that are widely recognized and whose properties are generally known. It is not our purpose to discuss various products that are offered under trade names. It is to be hoped, however, that the existing confusion may be clarified to some extent through publicity of the results of experimental work, emphasizing the specific chemicals that have been the most effective.

Although the use of root-promoting chemicals has been adopted by many plant propagators elsewhere, this is not generally true here in the Pacific Northwest. On the contrary, reports of failure have come to the attention of the writers and the general impression among western Washington nurserymen seems to be that chemical treatment is a useless idea that has received undue publicity.

The results of experiments conducted elsewhere with many kinds of cuttings, deciduous as well as evergreen, have been reviewed by several writers. For those who wish to learn of these results, the bulletins by Doran¹ (1), Maxon, Pickett and Richey (5) and Watkins (7) are suggested. For general information on plant propagation, including some information about the use of chemicals, books by Laurie and Chadwick (4) and Kains and McQuesten (3) will be helpful.

Factors in Plant Propagation

If it were possible to propagate all kinds of trees and shrubs by taking cuttings all at one time and giving them all the same treatment, a discussion of this subject would be fairly simple. This is not the case. For even a moderate degree of success it is necessary to have suitable propagating equipment, to know whether the plants in question can be propagated by means of cuttings, when to take cuttings from the different kinds of plants, what type of wood to take, what kind of rooting medium to use, what chemical treatment, if any, should be employed, and suitable methods of con-

trolling temperature and humidity. Investigators have found all of these factors to be important in connection with the use of root-promoting chemicals. It seems desirable, therefore, to summarize the more important factors in plant propagation and their relationship to chemical treatment before discussing further the use of chemicals.

Propagating Structures. The necessity of preventing excessive wilting of cuttings during the time that they are without roots calls for some method of maintaining a relatively high humidity in the air surrounding them. In commercial propagation this is accomplished by the use of glass-covered propagating frames and greenhouses. Glass structures have the additional advantage of transmitting light to the cuttings. A certain amount of light is necessary. Lath, muslin and cheesecloth-covered frames are used in special cases. In the home-propagation of a few cuttings, a small glass-enclosed box similar to a fish aquarium is often satisfactory when proper attention is given to ventilation and other requirements. Even a fruit jar inverted over a single cutting will sometimes suffice. It is difficult, however, to adapt these small propagating devices to the needs of all kinds of cuttings. Under most circumstances the amateur propagator will find that a larger, glass-covered frame or even a small greenhouse will give greater satisfaction. In greenhouses it is often necessary to provide additional humidity control by the use of glass-covered or muslin-covered frames on top of the propagating bench. This extra protection is especially desirable for soft cuttings taken in warm weather.

In rooting cuttings of evergreens by modern methods, including the use of chemical treatments, it is almost imperative to have a greenhouse. This is true because successful chemical treatment requires bottom heat under the propagating medium. Electric cables under a glass-covered outdoor frame make a fairly satisfactory substitute but it is difficult to maintain the desired temperature in such a structure during very cold weather.

Time of Taking Cuttings. With different kinds of plants, cuttings are taken in early
(Continued on Page Twenty)

1. Numbers in parentheses refer to literature cited at the end of this article.

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EditorJOHN H. HANLEY

ARBORETUM FOUNDATION

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To keep memberships in the Arboretum Foundation in good standing, dues should be paid during the month payable. Memberships more than three months in arrears will be dropped and the BULLETIN will be discontinued.

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The schedule listed above has the following exceptions:

a. That members of Garden Clubs, affiliated with the Arboretum and having membership of not less than \$10.00, shall be entitled to a \$2.00 or Associate membership.

b. That members of Arboretum Units shall be entitled to a \$2.00 or Associate minimum membership.

c. This schedule applies only to new memberships.

Arboretum Activities

TO BE able to work with the many types of plants which come into the Arboretum each year is a truly delightful experience. The form in which the material arrives is of no consequence. The acquisition may be only a few small seeds in a packet; or it may be a cutting, or a young seedling of a new type. In any form whatsoever, it is still intriguing to try to visualize the mature tree, or shrub, or vine, which will one day develop. Where is its native haunt? What kind of soil does it prefer? What exposure? How much sun? Will it grow in the Puget Sound country? How can it be displayed? These and many more questions arise as one reads the descriptions of the newcomers.

During the past season there has been ample opportunity to let one's imagination run along these lines. The year has been a truly rich one from the standpoint of plant acquisitions.

In order that you may have a better understanding and appreciation of the extent of this phase of the work of your Arboretum, we have gathered together a few of the facts. They are presented below, with suitable comments.

A total of 6,837 growing plants were received during the year ending May 31, 1945. Except for the herbaceous perennials (purchased for Woodland Garden), the majority were trees and shrubs which were planted in the cold frames, or lath houses, or into the nursery rows. We have learned that we are more successful with the later out-planting if the young trees and shrubs are allowed an extra year or two in the nursery area. There the root systems and the crowns fill out beautifully and the subsequent transplantation is not such a severe shock. This is particularly true of plants which have been shipped in from distant sections.

One of the greatest sources of satisfaction in the work of the Arboretum has been the friendliness exhibited by foreign institutions, a friendliness which has taken the form of their willingness to provide us with seeds of any plant species available to them and desired by us. During the year 828 packets of seeds, principally of trees and shrubs, were

received from these foreign sources. Of this number exactly 100 packets were of different kinds of rhododendron species, provided largely by the Edinburgh Botanical Gardens in Scotland. The Royal Botanic Gardens at Kew also contributed a few rhododendron species but their principal assistance came in the form of 392 packets of seeds of miscellaneous species of trees and shrubs, most of them very much worthwhile.

In connection with the handling of the seeds we have found that it is highly desirable to subject them to stratification, or to a period of cooling in the refrigerator, or to both. Most of the plants with which we deal are temperate zone species. The seeds, during the normal course of their development in nature, lie on the forest or grassland floor throughout the cool, dormant season. Many of them have evolved to the extent that they require just such conditions in order to be prepared for good germination the following spring. Hence the need for a cooling process for those which were collected when ripe and too often held for months in a warm, dry office or seed storage room before being shipped.

Most visitors to the Arboretum are not too interested in the seeds and young plants. They want to see large specimens, mature trees and shrubs, in full flower. To us it seems that at no time in the past have there been so many beautiful shrubs in flower. The rhododendron species and hybrids have been lovely since early March. The azaleas are now reaching a peak with several brilliant *R. kaempferi* hybrids holding the stage, along with some of the Ghent types and a few of the *R. occidentale* forms. These last named are of particular interest because they were developed in Europe and because the breeders there used the native Oregon azalea as one of the parents. *Kolkwitzia amabilis*, the beauty bush, is now in its prime; *Ceanothus papillosus* from California, has been most attractive; *Cornus Kousa* is approaching full flower. Yes, there have been beautiful color masses in the Arboretum this spring.

And these groups are being increased each year. In the period from June 1, 1943, to May 31, 1944, approximately 7,500 trees and

shrubs were planted in permanent positions. During the year ending May 31, 1945, another 7,400 plants were added.

Along Azalea Way alone there were 1,100 shrubs planted, all of them azaleas except approximately 100 rhododendrons.

In Rhododendron Glen 1,455 plants of several ericaceous types were used. Most of them were rhododendrons, of course, and many were forms which had not been sufficiently mature to produce flowers heretofore.

Some of these new species are extraordinary. If you haven't seen *R. elaeagnoides* in bloom it would pay you to visit the planting now. It is an exquisite, small-leaved type with rich, plum-purple flowers.

Anticipation of these new additions and the final culmination as they reach full-blown maturity are the bits of spice which enliven the work of an Arboretum. They also add the touch of real interest for our visitors.

* * *

Membership Report

THE membership committee is pleased to submit its report for the fiscal year 1944-1945. Due to the excellent cooperation extended by the many friends of the Arboretum we were able to far exceed the goal which had been set, namely, to increase both the financial structure and the numerical strength of the Arboretum Foundation.

At the close of the 1944 fiscal year the total membership was 1,254. It has now advanced to 2,161.

New memberships were obtained in various ways through an intensive campaign. About two-thirds of them came in through the medium of the Garden Club Membership Contest. The enthusiastic participation of garden clubs alone added 750 new names. The other third was secured through business firms, horticultural organizations, the Arboretum units, civic organizations and general letters.

The limitations of space in an already crowded BULLETIN will not permit the listing of the names of all those who assisted us in the many phases of the drive. However, the membership committee wants to be certain that all of its friends fully understand

how much their efforts are appreciated. The success of the drive could never have been assured without a tremendous amount of individual effort. For what you have done so magnificently, we express our deepest thanks.

MRS. WALTER J. SCHIBIG,
Chairman.

Awards

The following lists of winning clubs are based upon this classification:

- 1. Clubs having over 100 members.
- 1. Clubs having 50 to 100 members.
- 2. Clubs having up to 50 members.

GREATEST NUMBER OF NEW MEMBERSHIPS REPORTED

Club Name	Contest Chairman
1. West Seattle Garden Club	Mrs. Neil T. MacNeil
2. Amateur Gardeners	Mrs. William Bock
3. Alderwood Garden Club	Mrs. D. R. Lobdell

LARGEST AMOUNT OF MEMBERSHIP FEES

Club Name	Contest Chairman
1. West Seattle Garden Club	Mrs. Neil T. MacNeil
2. Amateur Gardeners	Mrs. William Bock
3. Alderwood Garden Club	Mrs. D. R. Lobdell

FIRST CLUBS REPORTING 100% PARTICIPATION

Club Name	Contest Chairman
1. North End Flower Club	Mrs. P. V. Highfield
2. Amateur Gardeners	Mrs. William Bock
3. Lake Washington Garden Club, Unit No. 2	Mrs. Arthur J. Krauss

The following have been placed on the Membership Honor Roll:

100% GARDEN CLUBS

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Arboretum Study Club	Mrs. W. A. Fisher
Lake Washington, Unit No. 1	Mrs. J. Swift Baker
Lake Washington, Unit No. 2	Mrs. Arthur J. Krauss
Lake Washington, Unit No. 3	Mrs. William Semar
Magnolia Peninsula, Unit No. 2	Mrs. Walter Larson
Magnolia Peninsula, Unit No. 3	Mrs. G. P. Locker
Magnolia Peninsula, Unit No. 4	Mrs. M. H. Freedman
Mercer Island Garden Club	Mrs. J. U. Haley
North End Flower Club	Mrs. P. V. Highfield
Queen Anne Garden Club	Mrs. E. A. Reising
Three Tree Point Garden Club	Mrs. Glenn Tritle

HONORABLE MENTION

Club Name	Contest Chairman
Alderwood Garden Club	Mrs. D. R. Lobdell
Bremerton Garden Club	Mrs. H. T. Lebo
City Wide Flower Club	Mrs. Rudolph Christensen
Darlington Home & Garden Club	Mrs. Naomi Benson
East Bremerton Garden Club	Mrs. H. C. Burwig
Lake Washington, Unit No. 4	Mrs. Henry Bittman
Lake Washington, Unit No. 5	Mrs. Frederick Bunge
Seahurst Garden Club	Mrs. L. M. Dimmitt
Seattle Amateur Chrysanthemum Society	Mrs. H. L. Virgil
Seattle Garden Club	Mrs. Field Agen
Tacoma Garden Club	Mrs. Corydon Wagner
West Seattle Garden Club	Mrs. Neil T. MacNeil

New Memberships

We take great pleasure in welcoming those who have recently joined the Arboretum Foundation.

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1 1 1

PROPAGATION OF EVERGREENS

(Continued from Page Fifteen)

summer (soft-wood), late summer (semi-hardwood) and during late fall and winter months (hardwood).

The narrow-leaved evergreens that are commonly used for ornamental purposes can be propagated by summer cuttings to some extent but, for the majority, late fall and winter is the better time. The species that are most widely used in forestry, such as pines, firs and spruces, are propagated chiefly, if not entirely, from seed. This method is necessitated by the difficulty of rooting cuttings of many species and also by the difficulty and costliness of obtaining cuttings. It seems likely also that expert forest tree propagators obtain as rapid growth from seeds as they could by the use of cuttings. There remains, however, the pos-

sibility of developing better root systems for transplanting purposes by chemical treatment of cuttings and the likelihood that certain desirable specimens must be propagated by vegetative means because of lack of viable seeds or because the characteristics of these trees will not be reproduced exactly from seeds.

Broadleaved evergreens include some forms that are among the most difficult to propagate. Rhododendrons are more commonly propagated by grafting than from cuttings, but when cuttings are used they usually are taken in late summer and fall. This is a suitable time for taking cuttings of most of the broadleaved evergreens, although several of them, including hollies, camellias and daphnes, will root satisfactorily even if taken later, provided they receive proper treatment.

With those ornamental shrubs and trees that lose their leaves in autumn (deciduous), softwood, semi-hardwood and hardwood cuttings are used. Softwood cuttings of the majority of species are ready in May, June and July. For further information on propagation methods for the different kinds of deciduous plants, reference may be made to the literature previously cited.

The importance of the time of taking cuttings cannot be too strongly stressed. But it must not be inferred that exactly the same date will be best for the same kind of plant in different years or under different conditions of climate and soil. The condition of the wood is the important factor and this must be learned largely by experience. This is one of the factors that makes the propagation of plants a very specialized profession and an intriguing (and sometimes exasperating) hobby for many "garden fans."

Selection and Preparation of Cuttings. Cuttings usually are made from new wood of the current season's growth, that is, from wood that is not more than one year old. As a rule, vigorous, plump new growth is best. Both over-vigorous and slender, weak growth should be avoided. With few exceptions, cuttings that are to be rooted in a cutting bench or frame should be approximately four to six inches in length. Terminal portions of vigorous side-branches usually furnish the best cuttings. Because vigor is important, old trees or bushes often do not yield good cutting wood. Taking cuttings from diseased, devitalized or half-dead plants is almost certain to result in failure.

It was formerly thought that all cuttings should be made with a sloping cut immediately below a bud (or node). Laurie and Chadwick (4) in experiments with many deciduous shrubs found that almost one-half of them gave the best results when the cut was made one-half inch below a bud or node. With nearly 25 per cent of the species the position of the cut proved to be of little importance, while a very few kinds gave best results with the cut one-half inch above a bud.

With leafy cuttings, a good, healthy leaf area seems to be a necessity but the lower

leaves usually are removed to prevent wilting and to make it easier to insert the cuttings in the medium. Usually about one-third of the leaves are allowed to remain on the upper portion of each cutting.

The Rooting Medium. With softwood cuttings of many species, clean sand of medium grade is a satisfactory medium for root formation. Evergreen cuttings taken in late fall and early winter usually respond best in a mixture of two parts sand to one of peat by volume. The best grade of horticultural peat should be used. Mixing will be facilitated if the peat is moistened well before mixing with the sand. No doubt valuable new materials will be discovered for use in propagating at least some species, but at present only the sand and sand-peat mixture are recommended for general use.

Handling the Cuttings. Special care must be taken to prevent the cuttings from drying out, beginning at the time that they are severed from the mother plant. Before insertion in the propagating frame the cuttings should be held between folds of wet burlap or similar material. Special care must be used in handling soft cuttings during warm weather. Especially during summer months, the propagating frame should be shaded sufficiently to prevent wilting of the cuttings and too rapid drying out of the propagating medium. The cuttings are inserted about one-third to one-half of their length into the sand or sand-peat mixture. In commercial practice, straight rows are laid out across the propagating bench, usually by the use of a straight-edged board and a long-bladed knife. The cuttings are placed one to three inches apart with three or four inches between rows. As soon as the cuttings have been placed in the medium, they should be "firmed in" and thoroughly watered.

Bottom Heat. Artificial heating of the propagating medium has proved to be so beneficial that it has been almost universally adopted in commercial propagating houses except for such propagating as may be done during warm weather. At Boyce Thompson Institute for Plant Research, Hitchcock and Zimmerman (2) found that root-promoting chemicals require a bottom temperature of 70 de-

grees F. to be effective in fall, winter and spring.

Chemical Treatments. The purpose of chemical treatment of cuttings has been to hasten root formation, to produce more roots and to increase the percentage of rooted cuttings. In some experiments, certain fungicides have been mixed with the hormones but the advantages of this practice are not fully established.

A discussion of this subject could become very complicated, but it seems to the writers that what propagators first need to know is the one chemical treatment that will be most useful to them. We have found indolebutyric acid to be very beneficial for the treatment of cuttings of evergreen trees and shrubs. This chemical is the one that is now most widely used by propagators. It is available, in solution, at most seed store and supply houses as Hormodin A and possibly under other trade names. We have not as yet tested this or other chemicals with cuttings of deciduous species but other writers (1, 5, 6) have reported beneficial results with these materials. In the Pacific Northwest the evergreens are of outstanding importance and we believe that chemical treatment will prove to be especially helpful with this group, since many of them are slow to form roots if not actually difficult to root without special treatment.

In applying a hormone it is essential that the cuttings absorb just enough of the hormone to obtain the desired result. Too much is almost certain to cause injury. Only minute amounts should be absorbed by the cuttings and the chemical should be applied only to the portion on which roots are wanted. Two methods are commonly employed. The first is by standing the cuttings in a very dilute solution of the chemical and the second is by dipping the basal ends of the cuttings in a dry dust made up of the chemical mixed with talc. Widespread interest has developed in the latter method but we strongly favor and recommend the solution method because it provides better control of absorption than can be obtained with the dust method.

The most effective concentration of indolebutyric acid for evergreen cuttings ranges

from 40 to 80 parts of the chemical to 1,000,000 parts of water. The cutting should stand in this solution to the depth of about one inch for 24 hours. It seems impossible to obtain such accurate control by the dust method, although dust treatments have proven to be effective with some species of plants. The reasons for our preference for the solution method can be presented best by referring to certain of our own experiments.

Experiments at Puyallup

A series of experiments was begun at the Western Washington Experiment Station in 1941 to determine whether cuttings from locally grown trees and shrubs will respond to suitable chemical treatment, which chemicals are most effective, and the best methods of applying them. Because it was impossible to work on all kinds of woody plants at once and because of the importance of evergreens in this region, only evergreen species have been tested up to this time. The results of these studies are to be reported in bulletin form so a discussion of only a few of them will suffice for present purposes.

Experimental Procedure

Propagation experiments with evergreen cuttings at the Western Washington Experiment Station have included comparisons of sand and a sand-peat mixture as propagating media, a study of the best concentration of indolebutyric acid solutions and a comparison between indolebutyric acid solutions and certain dust preparations. Most of the species tested gave similar results in the two media but certain ones, such as camellia, English holly and pieris (andromeda) showed definite preference for a mixture composed of two parts sand and one part peat by volume.

Experimental Results

Some of the results obtained with solutions of indolebutyric acid at different concentrations are shown in Table I.

In this experiment the acid was used in three concentrations, 40, 60 and 80 parts per million (p.p.m.). "No treatment" refers to cuttings that did not receive chemical treatment. The data show that all three concentrations of the chemical gave much better

TABLE I

Evergreen Cuttings Taken November 11 to 23, 1942, Treated for 24 Hours in Water
Solution of Indolebutyric Acid, Rooted in Sand-Peat with Bottom Heat

NAME	Days to root	No Treatment	Percentage Rooted		
			40 p.p.m. ¹	60 p.p.m.	80 p.p.m.
<i>Buxus sempervirens</i> (Box).....	56	32	88	88	84
<i>Chamaecyparis erecta viridis</i> (Green cypress)	90	20	92	100	100
<i>Chamaecyparis nidiformis</i> (Nest cypress)	78	28	100	100	100
<i>Chamaecyparis plumosa aurea</i>	65	40	80	88	80
<i>Chamaecyparis obtusa</i>	73	20	92	96	100
<i>Chamaecyparis wisseli</i>	95	12	80	100	100
<i>Camellia japonica</i>	61	16	84	96	100
<i>Ilex aquifolium</i> (English holly)	54	0	100	100	80
<i>Ilex pernyi</i>	54	0	92	100	100
<i>Juniperus sabina</i>	99	16	80	92	88
<i>Taxus baccata stricta</i> (Irish yew)	98	4	84	92	100
<i>Thuja Woodwardii</i>	62	0	92	100	100
<i>Thuja pyramidalis</i> (Pyramidal arborvitae)	72	16	84	92	92

¹Concentration of solution expressed as the number of parts of the acid to one million parts of water.

rooting than was obtained without chemical treatment. It should be stated, however, that the untreated cuttings of some species probably would have formed good root systems if allowed to remain in the propagating frame for a sufficient length of time. More rapid root formation, larger root systems and higher percentages of rooted cuttings of certain species seem to be ample justification for the use of the root-promoting chemical. With many species, higher percentages of rooted cuttings were obtained with 60 parts per million than with 40 and in only a few instances better results were obtained with 80 p.p.m. than with 60 p.p.m. From this and other experiments we have concluded that 60 p.p.m. is the most satisfactory strength for the indolebutyric acid solution for treating fall and winter cuttings of evergreens, if the propagator wishes to treat all cuttings with one concentration of the chemical.

Ilex Aquifolium (English holly) is typical of a group that produces a better type of root system after treatment with the chemical at 60 p.p.m. than when treated with 80 p.p.m. Certain of the narrow-leaved species developed roots on only one side of the cutting after treatment with 40 p.p.m., whereas several long

roots developed from the very base of cuttings treated with 60 p.p.m. and numerous roots grew from the entire treated portion with 80 p.p.m. In commercial propagation it may be worthwhile to use different concentrations to obtain superior roots on certain species.

Because of the increasing interest in dust treatments, an experiment was conducted in which certain dust preparations were tested in comparison with liquid treatment. Representative results of this experiment are given in Table II.

The data in Table II show that the two dust preparations used in this experiment were not as effective as the indolebutyric acid solutions with most species. *Skimmia japonica* responded equally to all treatments and almost as well without chemical treatment. The yews and some others responded better to Stimroot than to Rootone. The yew responded very well to another dust treatment, not shown here. This may mean that all species will respond well to a suitable dust treatment, but, for the present, at least, the solution treatment with indolebutyric acid is recommended for evergreen cuttings taken in late fall and winter.

Although chemical treatment of cuttings is

TABLE II
Evergreen Cuttings Taken November 4 to 15, 1944, Treated with Chemical Dusts and Solutions, Rooted in Sand-Peat with Bottom Heat

NAME	Days to root	Percentage Rooted With Treatment Indicated				
		No Treatment	Rootone (dust)	Stimroot (dust)	Indolebutyric Acid 60 p.p.m. ¹	80 p.p.m.
<i>Camellia japonica</i>	69	16	8	12	88	100
<i>Chamaecyparis erecta viridis</i>	88	24	40	84	88	96
(Green cypress)						
<i>Chamaecyparis nidiiformis</i>	85	20	76	96	100	96
(Nest cypress)						
<i>Chamaecyparis plumosa aurea</i> ...	65	56	64	76	92	88
<i>Ilex aquifolium</i>	60	0	0	0	96	92
(English holly)						
<i>Juniperus sabina</i>	101	44	64	60	80	92
<i>Juniperus tamariscifolia</i>	108	20	40	64	76	92
<i>Pieris japonica</i>	69	28	28	48	92	96
(Japanese andromeda)						
<i>Skimmia japonica</i>	48	88	100	100	100	100
<i>Thuja pyramidalis</i>	73	12	60	72	92	96
(Pyramidal arborvitae)						
<i>Taxus baccata stricta</i>	105	0	60	86	90	94
(Irish yew)						
<i>Taxus baccata fastigiata</i> <i>variegata</i>	96	12	56	88	88	96

¹Concentration of solution expressed as the number of parts of the acid to one million parts of water.

highly beneficial, when properly employed, it must not be assumed that chemical treatment is in any sense a substitute for skill in taking cuttings or in the management of the propagating frame. All of the factors in plant propagation, previously discussed, are equally important when chemical treatment is used. It may be mentioned again that chemical treatment of evergreen cuttings has given beneficial results only when the propagating medium has had bottom heat of 70 to 72 degrees F. When commercial root-promoting chemicals are used, the directions supplied by the manufacturer should be rigidly observed.

Summary

Plant propagators in the Pacific Northwest should profit by the use of root-promoting chemicals (hormones). Indolebutyric acid in the form of water solutions is recommended as having given the best results in experiments conducted at the Western Washington Experiment Station. With evergreen cuttings very satisfactory results have been obtained by soaking the basal portion of the cutting for 24 hours in a solution consisting of 60 parts of indolebutyric acid in 1,000,000 parts of water. Directions for preparing the indolebutyric

acid solution come with the package of indolebutyric acid which is available on the market as Hormodin A. These directions should be followed closely.

Chemical treatment of evergreen cuttings is effective only when the propagating frame is equipped to maintain bottom heat at 70 to 72 degrees F. The usual requirements for propagation, herein briefly discussed, are as equally important when chemical treatment is employed as when it is not used.

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One of the finest shrubs to bloom this spring at the Arboretum was *Ceanothus papillosus*, a form of the wild lilac of California.

Comments on Conifers

L. L. KUMLIEN*

BEFORE making any observations about conifers, let us take a quick review by considering what a conifer is, how many kinds there are in the world, and where they stand in horticultural importance.

The conifers belong to an ancient order of plants which are represented by only a relatively few remnants of living forms. They belong to the gymnosperms, those naked seeded plants of primitive tree life.

The conifers are the most important of the gymnosperms and share their botanical distinction with the gingko, the cycads, and the gnetales. The last three mentioned might pass from this world almost unnoticed.

The number of genera of conifers as classified by botanical authorities is variously estimated. This is because of some obscure genera which are sometimes regarded as species under another genus. We may take 46 genera as a reasonable figure. According to *Standardized Plant Names*, there are thought to be in cultivation in the United States 38 genera, leaving eight genera not represented. The list of the 38 genera are as follows, divided into two groups. The first list of 20 important genera represents about 888 species and varieties. The second list of 18 genera represents only about 50 species and varieties.

Important Genera

Abies	Juniperus	Sciadopitys
Araucaria	Larix	Sequoia
Cedrus	Libocedrus	Taxodium
Cephalataxus	Picea	Taxus
Chamaecyparis	Pinus	Thuja
Cupressus	Padacarpus	Tsuga
Cryptomeria	Pseudotsuga	

Unimportant Genera

Actinostrobus	Fitzroya	Saxegathaea
Agathis	Fakienia	Taiwania
Athrotaxis	Glyptostrobus	Tetraclinis
Callitris	Keteleeria	Thuyopsis
Cunninghamia	Phyllocladus	Torreya
Dacrydium	Pseudolarix	Widdringtonia

*The D. Hill nursery at Dundee, Ill., is the outstanding commercial firm in the field of ornamental conifers. The quantities that are propagated and grown each year reach proportions which are near-fabulous to the lay gardener.

Mr. L. L. Kumlien of that firm made a tour of the western states recently and consented to set down for us some of his observations regarding the use of conifers in the garden. We are pleased to present some of his thoughts and impressions.

The balance of seven obscure genera not listed in *Standardized Plant Names* are:

Acropyle	Austrotaxus	Callitropsis
Amentotaxus	Micracachrys	Diselma
	Pherasphaera	

It is interesting to note that in the list of 20 important genera, a large part of the total species and varieties are concentrated in a few genera. Out of the 888 species and varieties, 636 are found in only six of these genera:

Junipers	148
Pines	145
Spruces	108
Arborvitaes	91
Firs	87
Yews	57

636

Thus briefly considered we can see the outlines of the order a little more clearly.

In a recent extended trip through botanical gardens, arboretums, nurseries and private grounds along the entire Pacific Coast, the observation was frequently met with that "conifers are declining in interest" in that area.

If this is true the fault lies primarily with the nurserymen and not with the general public. Formerly conifers were in heavy demand for parks, cemeteries, large estates and elsewhere in plantings requiring large tree-like specimens. In recent years this type of development has declined and nursery stock now is in greater use by small home owners. These home owners do not have space for large growing conifers, but they are interested in dwarf and semi-dwarf trees in great assortment.

In the catalogs of English nurserymen of 1875—70 years ago—there was a much greater assortment of conifers than is being grown at the present time. In one catalog, for example, there are 375 conifers including a large number of the dwarf and slow growing forms.

In the Middle West the situation is somewhat ahead of the West Coast in the development of a wider assortment of smaller growth
(Continued on Page Thirty)

Report from England

FRED G. MEYER*

England,
March 12, 1945

Dear Dr. Hanley:

NO DOUBT you have wondered occasionally what has happened to me since I have been over here. Well, everything is going fine so far. Actually, I am waiting impatiently for the war to end. As it looks now, it should not go on very much longer. I have intended to write to you before, but I have also been planning to visit Kew Gardens for some time, so thought that I would wait until after that trip. Just this past week I had a two-day leave, and I took it in London, so I thought that you might be interested to hear just a bit about what I saw. Unfortunately, two days in London and Kew are barely long enough to more than say that I was just there, which actually amounted to just about that. I had a friend with me whom I knew at the Garden in St. Louis, so in that way the trip was a lot more interesting. I was sorry that I didn't get to see all of Kew—in fact, I only met Mr. Raffill who is assistant curator and in charge of the temperate house. He showed us the temperate houses and propagating greenhouses for temperate plants and we saw the grounds in the area around the temperate houses. There is actually so very much to see that one should have at least a week. I didn't see Mr. Osborne, one of the rhododendron men; in fact, he happened to be away at the time. Mr. Raffill has been at Kew for 47 years, so he pretty much knows his way about. I seemed to hit upon a very flourishing friendship with him, and he was offering to lend me his Zeiss Ikon camera before I left. He has not had film for it for five years; film isn't to

be had over here now. The temperate house has suffered bomb damage—in fact, just a bit over a year ago nearly all the glass was blown out from a bomb that dropped in the garden nearby. However, the glass has been replaced, and the plants seem to have recovered, even though Mr. Raffill said that there were thousands of them lost. You would especially enjoy the temperate house, and especially at this time of year. There were rhododendrons — beautiful specimens of *arboreum* and *barbatum* both over twenty feet tall. Also, they have a fine collection of the tropical rhododendron species. Several were in flower, and they are truly lovely things. Mr. Raffill has been very active in rhododendron work over the years and has many hybrids, which are in the temperate house. I saw *R. ciliicalyx*, one of the *Maddenii* series, in flower. It has large, pure white, scented blooms. It might be hardy at home, but it isn't at Kew. Then there was a very handsome specimen of *Magnolia Campbellii* in flower, which, without a doubt, is the prince of all magnolias. Another rare and newly introduced magnolia also in flower was *M. molychromata*. It is still rare in England. It has lovely light pink flowers that are cup-shaped and with a velvety sheen to the petals. I am going to try to get seeds if it is possible. Also there were several camellias; for instance, a twenty-foot specimen of *Chandlerii Elegans*, which certainly was magnificent; there was also a beautiful specimen of *grandiflora alba*. I have seen some smaller specimens of *Elegans* in the Puget Sound region just as beautiful. Camellias are not grown here to any extent out-of-doors; there should be many hardy varieties, but apparently that is not generally realized, and appreciated. Of course, there are hundreds of other things growing in the temperate house—palms, vines, etc. When I was there they had a beautiful showing of forsythias along the center aisle. It is quite a botanists' or gardeners' haven.

The surrounding grounds are equally well arranged and beautiful. Kew has the advantage of its age, now being over a hundred

*Mr. Fred G. Meyer of Tacoma, a member of the Arboretum Foundation, has been stationed at an army post in England for something over a year. In that time he has taken every advantage of his proximity to the great public and private gardens and has visited many of them, has met a number of the men in charge and has made notes of the interesting plant forms that are being grown. It is with real pleasure that we present below some of the interesting excerpts from his numerous letters. Mr. Meyer is a hearty enthusiast when it comes to Pacific Northwest horticulture and is eminently equipped to comment on things of the garden, not only because of his personal experience here, but also in the light of his excellent training at the Missouri Botanical Garden, St. Louis.

years old, so that most of the trees have reached maturity and add their true beauty to the general effect. There are some magnificent specimens of the deodar as well as the European live oak (*Quercus Ilex*). The early spring bulbs were a glory—crocus, snowdrops, glory-of-the-snow, and early daffodils. One of the early flowering plums was in flower, too. It so happens that the climate of Kew is a bit too cold for some things that we in Washington would consider hardy; such as camellias of the more tender types and some of the more tender rhododendrons. The limiting factor for many things all over England is the late spring frosts, which often are quite severe. It just happens that Kew is located in a cold pocket. It seems that if one finds just the right location though, one can grow practically anything here. I am very anxious to get to Wales and particularly the southeastern tip, Cornwall. The climate on the western side of England and Scotland is a great deal milder than on the eastern side; therefore, from the standpoint of raising plants, there is quite a lot of difference. I recently heard of a fifty-foot specimen of *Rhododendron Falconeri* in Cornwall and a large flowering specimen of *R. sino-grande*. *R. giganteum*, which in its native haunts is reputed to attain a height of 80 feet, also flowered in Cornwall and Scotland. I tried to get a specimen to export with my lot this spring, but I was unable to secure one small enough for shipping.

You might be interested to know that I have made a very good contact with a rhododendron nursery just outside of London, the Sunningdale Nurseries. It was referred to me by Kew as having one of the best collections of both hybrids and species. The owner, Mr. James Russell, supplied me last fall with an up-to-date list of what he has in the line of new hybrids and also a fine descriptive list of the best species that have been and are being used for hybridization. Naturally, I succumbed to the temptation and just last week a shipment left for my home at Olympia. A doctor friend at home who is interested in rhododendrons and camellias, also purchased quite a lot. He is caring for mine while I am gone, and I hope that I will not be away too long.

The hybrids that I got are the finest to come from the Lionel de Rothschild collection that have been produced up to just before the war, and it is the first time they have been exported. In fact, they are not even in the trade over here as yet. For instance, there is a *dichroanthum* x *Griersonianum* cross, which should be very good; *Griersonianum* x *Elliotii*; *didymum* x *Kyawi*, *Mosers Maroon* x *blood red arboreum*; *cinnabarinum* x *Maddenii* var. *Heldreichii*, to mention only a few. As for species I have *arboreum* (Tregothnan best scarlet form), *auriculatum* (Kingdon-Ward best form), *campanulatum* (Knaphill var.), *concatenans*, *fictolacteum*, *decorum*, *discolor*, *Pemakoense*, *Macabeum* (Grande series), *sino-grande*, *elatum*, *Wardii* (Rock's form), *augustinii* (Rothschild form), and *dichroanthum* to mention a few of the thirty-one species. Mr. Russell has a very fine collection of *azaleodendrons* and *azaleas*. He thinks that there are now few, if any, better such collections. I hope to see them in flower this spring and to pick out some of the best ones. He says there are blood red *Mollis* hybrids, as well as others that are as spectacular, including the Ghent hybrids. I only wish that I could have seen the nursery in peace time. He is not allowed to do any more propagating now and he can't get labor to care properly for what he does have; consequently, things do not look as good as they might. His nursery is now nearly a hundred years old, having been established in about Hooker's time. In fact, there are still on the premises several plants from the seed which Hooker brought back from the Himalayas, including *R. Thomsonii*, and *R. cinnabarinum*, which now are nearly a hundred years old. Also, there are some one-hundred-year-old plantings of a few of the very old hybrids of both *Mollis* azaleas and rhododendrons. It will surely be a sight to see them in flower this spring. Among other things, Mr. Russell is quite interested in alpenes and he has agreed to trade anything you could get him in alpine seeds for anything he can get in rhododendrons. Really, he is most cooperative, and if you would send to me a list of the rhododendrons you don't have I am sure that he could get you seed; in fact, if you want

anything else in particular let me know, and no doubt he can get them, such as primula species, ericas, meconopsis. By the way, the man who wrote the monograph on *Meconopsis* is now living in the town near where I am stationed, and I met him recently. He was collecting for the British Museum in Tibet before the war. There are about twenty-five species of *Meconopsis* grown in England. We raise *Baileyi*, and what else?

As far as growing is concerned, England has *nothing* on Puget Sound, believe me. They have to grow peaches on south walls, and we certainly don't have to do that.

April 12, 1945

Since my Kew visit last month, the season has been advancing a great deal, and now many things are making growth and producing flowers. Spring is early here this year; consequently, I have been trying to make the most of what time I have had available. Recently I made a very excellent contact with a Dr. G. Taylor who is with the British Museum but is now doing war work. He is a Scotsman and a prince of a fellow. He is very enthusiastic and apparently his influence carries considerable weight among botanists over here. He was the one who monographed *Meconopsis*—the genus of the famous blue poppy. He is also interested in *Potamogeton* and is collaborating with another botanist on the genus. He has been to Ruenzari, or commonly called the Mountain of the Moon of East Africa and has also been to Tibet. While he was in Tibet he collected with Major Sherriff—the man who has been doing a lot of rhododendron collecting there. Dr. Taylor has told me a lot about Tibet—and it certainly must be a fertile spot for the botanist. I would give a lot to go there some time.

Dr. Taylor is a former student at the Botanic Garden at Edinburgh and this last weekend I met him there and spent Sunday in the Botanic Garden. You would marvel at that place, too. This was my second visit but last fall there wasn't a great deal in flower. However, this being an early spring, the early rhododendron species were at their best. Dr. Taylor introduced me to the regius keeper, Dr. Sir William Wright Smith; Dr. J. M. Cowan, as-

sistant keeper, and Mr. Lamont, the assistant curator, all of whom went around to show us what was in flower. The garden itself has a marvelous store house of Chinese and Himalayan plants and it has the affiliation with Edinburgh University (like the Missouri Botanical Garden has with Washington University) to confer degrees, etc., with quite excellent facilities in the way of laboratories, and lecture rooms right at the garden. I was with Dr. Cowan, the assistant keeper, only for a little while, and I may get to know him better if I avail myself the opportunity. He is now working with the Forestry Department and has the proper means of getting around and he knows where the outstanding gardens are. I have three days coming up and don't know for sure whether I shall go there or to Bodnant in North Wales to the Lord Oberconway place, which I must see before I leave this country.

The rhododendrons at Edinburg were marvelous. They are arranged in such a way that at this time of year the species make the real show. They certainly have novel ways for growing the more tender species, which I put under my cap and hope to duplicate some day. For instance, with all the large leaved species, *i.e.*, *Falconeri*, *Hodgsonii*, *calophytum*, *arizelum*, etc., they make use of tall hedges of either a conifer such as yew, or holly. They are planted so that the allees are in the opposite direction from the prevailing cold winds. They have also solved the shade problem and have adapted the needs of the species to the right amount of shading. They use a leaf mulch a great deal because the soil is quite sandy. They like oak leaves especially well for mulching. You remember that I told you that I imported some rhododendrons this spring from a nursery in south England and fortunately many of the species that I bought were in flower at Edinburgh. I made a list of the ones which I thought were particularly good and have enclosed this list to you. (The list and Mr. Meyer's comments follow.—*Ed.*)

Another type of special garden which they have and which could also be reproduced at Seattle is their rootery. Actually, it is made from slabs and sheets of top material from local bogs—the compositions being made up of

rushes, sphagnum and other small ericaceous plants. These sheets and slabs are built upon each other in the fashion of a rockery with interspersed rocks for support. Also, in various places roots of upturned trees are judiciously placed. Upon this sub-stratum they plant anything of a dwarf nature that likes acid conditions—namely, primulas, dwarf rhododendrons on the roots, and any other acid loving plant—but not to include the larger rhododendrons. You should see the marvelous results obtained, too. I could visualize possibilities at your Arboretum. They really are unlimited. Actually, the terrain at Seattle is even better than Edinburgh with a wider selection of habitats—this is also the same with Kew.

Most of the plantings in the garden are species plants, but a few are of hybrid origin. Many, if not most, of the plants are from seeds, either brought back or sent by collectors from the Himalayas, Tibet, China or other regions where indigenous species are found. The species recorded are especially fine for cultivation either for the flowers, foliage or both.

R. impeditum—This is a dwarf species and very closely related to *R. lapponicum*. I saw two plants of these species growing side by side and little or no difference could be detected. Rootery.

R. Humming Bird—*R. haematodes* x *Williamsianum*—One and one-half feet, makes a spreading plant, flowers waxy red. A very fine plant. Rootery.

R. Pemakoense—A dwarf species, good for rockeries. Rootery.

R. emasculum—A hybrid of unknown origin, but with beautiful large, pink flowers.

R. haematodes—A really fine species. There are several forms growing in the garden at Edinburgh. Dr. Cowan, assistant director, thinks this species one of the finest. Rootery.

R. Morii—A hybrid, the best form has a deep red throat.

R. scyphocalyx—Several forms have various shades from a dirty orange to a fairly clear orange, but this is an interesting plant with a good, compact, growth form.

R. uniflorum—A rather handsome species with lilac colored flowers. Best form seen is K. Ward No. 5876. Rootery.

R. repens—A fine dwarf species with brilliant red flowers. Rootery.

R. Albrechtii—One of the azalea series with very clear pink flowers. A very good species.

R. coryphaeum—A fine large-leaved species with large flowers.

R. fictolacteum—A really fine species with white flowers and beautiful, large leaves.

R. neriiflorum—One of the best for red color.

R. orbiculare x *Williamsianum*. A very fine hybrid.

R. cinnabarinum—A yellow flowered form which is very good. Cooper's form (Bhutan).

R. Aucklandii roseum x *strigillosum*—A very fine hybrid.

R. campylocarpum x *Williamsianum*—A very fine hybrid.

R. quinquefolium—One of the azalea series and quite good.

R. russatum—A very fine species. No. 235-39.

R. adenogynum—Excellent.

R. Wrightii—Good flower but a straggly plant.

R. sanguineum—A fine compact plant with deep red flowers, one which would possibly make a good parent.

R. Diane—A *campylocarpum* hybrid.

R. arboreum x *sutchuenense*—A very good hybrid with fine, waxy-pink flowers.

R. Augustinii—All the forms have blue flowers, but No. 471-38 was the bluest in the garden.

R. argyrophyllum—A very fine pink-flowered species well worth growing.

R. haematodes—Forrest 28351. Rootery.

R. arizelum—One of the large leaved forms with yellowish flowers.

R. Macabeum—A fine large leaved species. The best form at the garden has deep magenta colored flowers.

R. Falconeri—Flowering specimens in the garden are thirty feet tall.

R. campylocarpum—A fine yellow flowered species.

R. lapponicum—Very closely related to *R. impeditum*. Rootery.

R. Smithii—Close to *R. barbatum*, but much hairier and with deep red flowers.

Other plants which were of note are:

Syringa oblata Giraldui—An early flowering lilac which was in full bloom on April 8.

Prunus nanus var. "*Fire Hill*"—A very attractive plant with deep pink flowers which literally cover the plant.

Berberis lologensis—A hybrid of *Berberis Darwinii* x *linearifolia*. This is a very fine plant and well worth having. It is much better than either of the species. It has reddish flowers.

Enkianthus Pablinii—An ericaceous large shrub with Chinese lantern-like flowers of various colors.

1 1 1

CONIFERS

(Continued from Page Twenty-Five)

ing conifers. Sale of large growing pines, firs and spruces has greatly declined, but the growing of assorted junipers and yews has increased tenfold.

While it is true that the available supply of broad-leaved ornamental material and interesting flowering plants available to planters along the Pacific Coast compete heavily for the interest of gardeners who might otherwise use conifers, I do believe that the conifer interest only needs to be increased by having made available through nurserymen a larger assortment of interesting new dwarf and semi-dwarf forms to add to the plant materials in that locality.

1 1 1

Sawdust As A Soil Conditioner

There has been considerable discussion among large-scale gardeners in the Northwest of the value of sawdust as a mulch and soil conditioner. The following quotation from the *Victoria Horticultural Society Garden Notes* will help keep our readers abreast of the latest reported information:

"'The Effect of Sawdust on Plant Growth' was the subject of research recently in Michigan by L. M. Turk. Sawdust has a depressing influence on plant growth because the organ-

isms which rot it compete with the plants for the nitrogen in the soil. This is overcome with excellent results by adding about two pounds of sulphate of ammonia or nitrate of soda per 100 pounds of sawdust. Organic nitrogen in the form of dried blood or manure may also be used. Sawdust has practically no fertilizer value. It contains $\frac{1}{2}$ pound plant food per 100 pounds, but its availability to plants is negligible. Its chief benefit is of a physical nature when mixed with the soil. Like manure or peat, it helps to loosen heavy soil, increases aeration, makes cultivation easier and increases water penetration. It has a high water absorbing capacity and this is its chief value when used on light soils. As a mulch, its chief function is to preserve moisture by protecting the soil from the drying influence of sun and wind and to increase absorption of rain by preventing runoff of surface water. 'All the evidence indicates that the sawdust can be satisfactorily applied to soils containing an adequate amount of nitrogen or if supplemented with sufficient nitrogen to offset the probable depressing effect on the available nitrate supply in the soil,' the author concludes. Under our conditions, hemlock and spruce are probably superior to the more resinous fir and cedar sawdusts. The former are ideal for heathers, rhododendrons and woodland plants."

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There is always some question of survival involved when one attempts to bring a plant into a new habitat. Thus it has been a great pleasure to discover that the mountain hemlock, *Tsuga mertensiana*, has been developing very satisfactorily in the nursery. There is no reason to expect that it will not succeed in the permanent plantings if the performance to date is typical.

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One of the most interesting broad-leaved evergreens that can be found among our native vegetation is the California myrtle, *Myrica californica*. It is found in relative abundance in Southwestern Washington, near the coast. Its beauty certainly merits greater garden usage.

The Mountain Beaver As Is

THEO. H. SCHEFFER*

MANY readers of THE BULLETIN will need no introduction to the mountain beaver, though they may never have seen the animal but only his trails and food caches. If you did not catch the name on first acquaintance, no matter; it is a misnomer, if not an alibi. Like the guinea pig, which is neither a guinea nor a pig, the mountain beaver is not a beaver and usually lives on lower slopes and in valleys. The ancestry of the animal is obscure—only in the record of the rocks. At present we recognize one family, one genus, and a single species with some geographical variations, along the sea edge of our Pacific coastal states, its only habitat. The Indians called it “sewellel”; at least Lewis and Clark gathered that much from their vocabulary, though they may have merely wished to call attention to the blankets of its skins which they would trade for what-have-you. They were not very good blankets, either, by modern standards. At one time we gathered together several thousand skins for the New York fur trade, at its request; but the pelts were pronounced too thin on the “soft underbelly” and too mangy at times.

For your information, if you haven't met the mountain beaver, it is in general appearance and size something like a muskrat docked of its tail. It has weak, non-sparkling eyes, which are all it needs for an existence mostly underground, where logs and stumps and fern copse give it all the privacy a shy animal might want. It comes out mostly at night to forage—and get hit on the highways. Occasionally it will be seen any time of day grabbing a mouthful of green stuff and dodging back to its burrows; it may even be climbing slender saplings to cut off side twigs and terminal growth for its stores. In this game it is wise enough to leave stubs of the twigs for rounds of its ladder. In general, it is not a

good climber, having long claws for digging. Its ears are quite short, but its whiskers are long, like most other nocturnal prowlers.

The gardener, the orchardist, the keeper of parked landscape and arboretum will have a keen interest in the mountain beaver, measured by the damage the animal may do or has done to their plantings. For our experience has shown that this rodent will cut off any green thing that grows, whether he cares to eat it later or not. Rhubarb, onions, devil's club of the forest, skunk cabbage, holly, to say nothing of ornamental shrubbery and fruit trees. This stuff is cached temporarily at a burrow entrance, to be eaten in part there, in part carried farther back for later consumption. Often neat little piles of forage are left in an open spot, as on a log, either to cure or from whim of neglect. If cured, it may be used for nesting materials; but we have found no evidence that the mountain beaver “makes hay” for storage, like the cony of the mountains. The latter must store for his shut-in days, while the sewellel may feed abroad at any time of year on green stuff. After disappearance of the snow in the foothills we may find their trails and the cleanly barked saplings that had been weighted down; or, if erect, girdled higher than one's head from the platform of a crusted snowdrift.

Though not in any sense aquatic, the mountain beaver is not troubled by our coastal wetness and usually dwells not too far from running water. The vagrants will pad up and down a shallow stream bed and may appear mysteriously in your garden or shrubbery from the subway of a drain tile. They may even visit your porch boxes on blundering errands intent, though only a few such visitations have come to our notice. Never a creature of the denser forests, the race has done very well, thank you, since the axe has expanded its local habitat. For the deciduous shrubs and trees that follow the conifers are more to the animal's taste for food supply. Suburban premises or gardens of the smaller clearings in the newlands are therefore the

*Mr. Theo H. Scheffer has been a member of the staff of the Bureau of Biological Survey for years. He has had wonderful opportunities to study many of the animals which present rather serious garden problems in some sections. Our readers may recall his article of a year ago on moles and their control. Now you may profit by his knowledge of another animal pest—the mountain beaver.

more likely to be exposed to mountain beaver depredations.

In the month of April the sea gull, more likely the shag, brings twins or triplets to the sewellel's nest, usually high and dry under an old stump or a fallen log. It seems to take two years, in some cases at least, for the young female to reach the age of debutante. Although the fatlings sometimes went to pot, as related to the writer by Indian Dick, they do not appear to have been greatly relished by the red men. Nor does their subterranean rankness appeal to the white men who are pushing the aborigines off the map.

Lest some are waiting to know what to do about it, we will explain here. To all observations and accounts, the depredations of the mountain beaver on our premises may be very exasperating, not to say serious. One may recognize the work of this rodent by the stubs on trimmed shrubs or berry canes; the little piles of green forage (perhaps our prized plants) cached near the animal's retreats; the open burrow at the edge of the clearing, with dirt kicked out at the back doors. In our recollection scores of mountain beavers were trapped in such retreats on the University campus some years ago. For they trap readily, either in the ordinary No. 1 steel trap, or in a box trap baited with apple or carrot. The former should be set snugly inside the mouth of a clean, open burrow; securely staked, but not necessarily covered, for these animals do not seem to have much sense of human craftiness. To test this conclusion we have retaken the same individual at the same spot for several days in a stretch, releasing him at each visit and rebaiting the trap. We abandoned the experiment in disgust when the animal stuck around expectantly while we provided more of our depleted bait stock.

We prefer to use the box trap, rather than the steel trap, which has the lesser sentimental appeal. But exasperation will often make no choice. If the box trap is to be used, any Boy Scout may know how to construct one. In this case, it should be about nine or ten inches high and wide and twice as long. The top and the end piece are nailed together in front and hinged by two nails at the back. At

the closed end of the trap is a post or "steeple" for the trigger string, about as high as the trap is long. The trigger itself is of the figure-4 type, with bait on the inner end and a trail of bits of peeling laid to the burrow opening close by. If perplexed by these details, write the Experiment Station at Puyallup for blueprints (blackprints) of the trap.

We cannot recommend poisoning for this or any other creature of the wild. Poison is for rats, which often defy any other readily available methods we may have for their destruction.

1 1 1

Why Lilacs Don't Bloom

The *Florists Review* for May 17, 1945, carried a note under the above heading which is quite timely. The increasing use of lilacs in the Northwest prompts us to pass the information along to our readers.

"From a half century devoted to the culture of lilacs and other shrubs, L. W. Hagerman, formerly superintendent of the famous Lilacia Park, Lombard, Ill., offers a list of the probable factors causing the oft-repeated question, "why don't my lilacs bloom?" His list follows:

1. Planted in too dense shade and loss of moisture and food caused by nearby trees or shrubs and their encroaching roots.
2. Excessive growth of suckers and water sprouts and the neglect of their removal.
3. Failure to remove dead and diseased branches and improper pruning practice.
4. Bushes planted too closely and where air circulation is retarded.
5. Poor drainage and undesirable acid soil condition.
6. Excessive loss of blooming wood in the cutting of bouquets and incorrect methods used.
7. Loss of vitality due to failure in the control of borers, scale and powdery mildew.
8. Bushes still too young or proper care not given previous to and at time of planting."

1 1 1

Dr. F. W. Went of Cal. Tech. has demonstrated that it is low night temperature which prevents fruit-setting in tomatoes.

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